

**SLOW WAVE OPTICAL WAVEGUIDE FOR VELOCITY MATCHED  
SEMICONDUCTOR MODULATORS**

**ABSTRACT OF THE DISCLOSURE**

A PIN electro-optical traveling wave modulator (10) including diffraction gratings (34, 36) positioned at opposing sides of an optical waveguide (20) that act to change the propagation pattern of the waveguide (20). The modulator (10) includes an N-type layer (14), a P-type layer (18) and an intrinsic layer (16) acting as the waveguide (20). A metal electrode (26) is in electrical contact with the N-type layer (14), and a metal electrode (30) is in electrical contact with the P-type layer (18). The electrodes (26, 30) define an RF transmission line. An optical wave (22) propagates along the waveguide (20) and interacts with the gratings (34, 36) which slow the optical wave (22) to match its speed to the speed of the RF wave in the transmission line. In one embodiment, the gratings (34, 36) are 2-D gratings formed by vertical holes (38) in the waveguide (20).